

employed that illumination beams from a plurality of light sources are made incident in parallel into the fly-eye lens and three more fly-eye lenses are arranged after the first one (four fly-eye lenses in total).

Incidentally, four or more fly-eye lenses may be employed, though the second and third embodiments as described above employ three fly-eye lenses. Also, at least one of the plurality of fly-eye lenses may be replaced by a rod optical integrator. Further, the number of light sources may be three or more. Although the above embodiments employ a mercury lamp as a light source, the present invention can be applied to cases where a light source of illumination beam is an excimer laser source, a light source for generating harmonics of argon laser beam, or another lamp light source. Especially in case of a laser light source being employed as a light source, the speckle pattern on the surface of wafer can be decreased with application of the present invention. Further, the present invention can be applied not only to the scanning projection exposure apparatus but also to the projection exposure apparatus of the full exposure method such as ordinary steppers. In particular, in case the illumination area on the reticle is rectangular, an increase in illuminance of illumination beam and an improvement in illuminance uniformity can be expected with application of the present invention.

What is claimed is:

1. An exposure apparatus for exposing a pattern onto an object, comprising:

an exposure system which exposes said pattern onto said object; and

an exposure control device which has a first exposure mode for exposing said pattern onto said object employing said exposure system and a plurality of light sources and a second exposure mode for exposing said pattern onto said object employing said exposure system and one or more light sources whose number is smaller than the number of light sources employed in said first mode.

2. An exposure apparatus according to claim 1, wherein an exposure time under said first exposure mode is shorter than an exposure time under said second exposure mode.

3. An exposure apparatus according to claim 1, wherein the number of light sources employed under said second exposure mode is one.

4. An exposure apparatus according to claim 1, wherein said exposure apparatus is a scanning type exposure apparatus that exposes said pattern onto said object while said object is being moved.

5. An exposure apparatus according to claim 4, further comprising an object stage which moves while holding said object.

6. An exposure apparatus according to claim 5, wherein the speed of movement of said object stage under said first exposure mode is different from that under said second exposure mode.

7. An exposure apparatus according to claim 6, wherein the speed of movement of said object stage under said first exposure mode is higher than that under said second exposure mode.

8. An exposure apparatus according to claim 5, wherein said object stage has a holding portion which holds said object along a horizontal direction.

9. An exposure apparatus according to claim 4, further comprising a mask stage which moves while holding a mask formed with said pattern.

10. An exposure apparatus according to claim 9, wherein said mask stage has a holding portion which holds said mask along a horizontal direction.

11. An exposure method for exposing a pattern onto an object, comprising:

selecting one of first and second exposure modes to expose said pattern onto said object;

said first exposure mode employing a plurality of light sources, and said second exposure mode employing one or more light sources whose number is smaller than the number of light sources employed under said first mode; and

exposing said pattern onto said object under the selected exposure mode.

12. An exposure method according to claim 11, wherein an exposure time under said first exposure mode is shorter than an exposure time under said second exposure mode.

13. An exposure method according to claim 11, wherein the number of light sources employed under said second exposure mode is one.

14. An exposure method according to claim 11, wherein, under each of said first and second exposure modes, said pattern is exposed onto said object while said object is being moved.

15. An exposure method according to claim 14, wherein the speed of movement of said object under said first exposure mode is different from that under said second exposure mode.

16. An exposure method according to claim 14, wherein the speed of movement of said object under said first exposure mode is higher than that under said second exposure mode.

17. An exposure method according to claim 14, wherein said pattern is formed on a mask.

18. An exposure method according to claim 17, wherein said object and said mask are moved in synchronization under each of said first and second exposure modes.

19. An exposure method according to claim 11, further comprising changing at least one of said light sources.

20. An object onto which said pattern has been exposed by the method according to claim 11.

21. A method of manufacturing an exposure apparatus for exposing a pattern onto an object, comprising:

providing an exposure system which exposes said pattern onto said object; and

providing a controller which has a first exposure mode to expose said pattern onto said object employing said exposure system and a plurality of light sources, and a second exposure mode to expose said pattern onto said object employing said exposure system and one or more light sources whose number is smaller than the number of light sources employed in said first mode.

22. A method according to claim 21, wherein an exposure time under said first exposure mode is shorter than an exposure time under said second exposure mode.

23. A method according to claim 21, wherein the number of light sources employed under said second exposure mode is one.

24. A method according to claim 21, wherein said exposure apparatus is a scanning type exposure apparatus that exposes said pattern onto said object while said object is being moved.

25. A method according to claim 24, further comprising: providing an object stage which moves while holding said object.

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26. A method according to claim 25, wherein the speed of movement of said object stage under said first exposure mode is different from that under said second exposure mode.

27. A method according to claim 26, wherein the speed of movement of said object stage under said first exposure mode is higher than that under said second exposure mode.

28. A method according to claim 25, wherein said object stage has a holding portion which holds said object along a horizontal direction.

29. A method according to claim 24, further comprising:

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providing a mask stage which moves while holding a mask formed with said pattern.

30. A method according to claim 29, wherein said mask stage has a holding portion which holds said mask along a horizontal direction.

31. An object on which said pattern has been transferred by an exposure apparatus manufactured by the method according to claim 21.

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32. An illumination apparatus comprising:
an optical integrator which forms a plurality of light sources from a
light which is incident thereon from a light source; and

an optical member which is disposed in an optical path between
the light source and the optical integrator and which increases a fill ratio of the
plurality of light sources.

33. An illumination apparatus for illuminating an illumination surface,
comprising:

a light source;

an optical integrator which is arranged in an optical path between
the light source and the illumination surface and forms a plurality of light sources
from a light which is incident thereon from the light source; and

a diffractive element which is arranged in an optical path between
the light source and the optical integrator and is arranged at a conjugate position
of the illumination surface or near the conjugate position of the illumination
surface .

34. An illumination apparatus comprising:

a light source;

a first optical integrator arranged in an optical path between the
light source and an illumination surface;

a second optical integrator arranged in an optical path between the
first optical integrator and the illumination surface; and

a third optical integrator arranged in an optical path between the
second optical integrator and the illumination surface.

35. An illumination apparatus comprising:

a light source;

a diffractive element arranged in an optical path between the light
source and an illumination surface;

an optical member which is arranged in the optical path between
the light source and the illumination surface and has a plurality of optical surfaces
which are two-dimensionally arranged; and

an optical integrator arranged downstream of one of the diffractive element and the optical member.

36. An illumination apparatus comprising:

a laser source;

a first optical member which is arranged in an optical path between the laser source and an illumination surface and has a plurality of optical surfaces arranged two-dimensionally;

an optical relay system arranged in an optical path between the first optical member and the illumination surface;

a second optical member which is arranged in an optical path between the optical relay system and the illumination surface and has a plurality of optical surfaces arranged two-dimensionally; and

an optical integrator arranged in an optical path between the second optical member and the illumination surface.

37. The illumination apparatus according to claim 36, wherein the optical integrator includes a rod optical integrator.